

## UNITED STATES PATENT APPLICATION

for

INSTALLATION OF APPLICATION SOFTWARE  
THROUGH A NETWORK FROM A SOURCE COMPUTER SYSTEM  
ON TO A TARGET COMPUTER SYSTEM

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## BACKGROUND OF THE INVENTION

### 1. Field of the Invention

The present invention relates generally to the field of management of computer systems on a network, and specifically to installation of application software on computer systems through a network.

### 2. Prior Art

Local Area Networks (LANs) have been developed for interconnecting computer systems for communication amongst computer users, for the exchange of data and for the sharing of resources (e.g. printers, facsimile devices, modems and the like). To properly implement and manage a LAN, a LAN administrator is needed. A LAN Administrator's duties may include such functions as registering users to use the Local Area Network, maintaining the shared resources and monitoring the network load. LANs may also be used to manage the computer systems connected to the network.

With respect to management of the computer systems on the LAN, a desirable function for the LAN administrator is to remotely install application software on systems. Moreover, it would be desirable to perform such installations without the presence of the LAN Administrator. However, known techniques for remote installation of software require the writing of scripts outlining the installation procedures. The writing of scripts is a manual, error prone task which must be performed for each system onto which an application is to be installed.

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An improved implementation for remote installation of applications by a LAN administrator is the netOctopus™ program, available from B&L Impuls

Software GmbH. netOctopus operates in an Apple® Macintosh networked environment. netOctopus provides for the remote execution of installation scripts on systems in which the application software is to be installed.

netOctopus utilizes the installer program that accompanies each Apple

5 Macintosh system. However netOctopus merely allows the LAN Administrator to perform the installation across the network, as if they were sitting at the workstation themselves.

Consequently, it would be desirable to provide a means for automating

10 script generation for remote installation of application software by a LAN Administrator. Further, it would be desirable to provide for such remote installation in a manner that does not require the presence of the LAN Administrator.

## SUMMARY

A technique for the remote installation of application software from a source computer system to one or more target computer systems (workstations) coupled to a Local Area Network (LAN) is disclosed. The present invention 5 allows a LAN Administrator to install application software on a user's workstation automatically at any time without user's intervention. The state of (i.e. a snapshot of) the LAN Administrator's system before and after the installation of the application software is captured and an installation package is built. Installation on the user workstations is then scheduled. At that time the 10 installation package is transmitted to the user's workstation where a program carries out commands in the installation package for installing the application software.

The installation package consists of an IPACK format file and the files 15 contained in an application software program. The IPACK format file contains sets of commands that are used to modify system files and perform other functions necessary to the installation of the application software. Further, a personality file may be defined which allows for custom tailoring of the installation on a user's workstation. Further, a UPACK format file provides 20 instructions for deinstalling application software. Deinstallation of application software is necessary for removing unwanted or outdated applications from the user's workstation.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 is a block diagram of a computer system which may be utilized as  
a LAN administrator workstation or user workstation in the currently preferred  
5 embodiment of the present invention.

Figure 2 is block diagram of a LAN with a LAN Administrator  
workstation and user workstations as may be implemented in the currently  
preferred embodiment of the present invention.

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Figure 3 is a block diagram illustrating the architecture of the main  
components of the LAN administrator workstation and a user workstation for  
implementation of the currently preferred embodiment of the present invention.

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Figure 4 is a flow chart illustrating the steps performed by the LAN  
Administrator workstation (source system) and the user workstation (target  
system) in performing remote application software installations in the currently  
preferred embodiment of the present invention.

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Figure 5 is a block diagram illustrating the inputs and outputs for  
generating an installation package on a LAN Administrator workstation as may  
be performed in the currently preferred embodiment of the present invention.

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Figure 6 is a block diagram showing the inputs and outputs for installing  
an application package on a user workstation as may be performed in the  
currently preferred embodiment of the present invention.

### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

A technique for the remote installation of application software on user workstations connected to a Local Area Network (LAN) from a LAN Administrator 5 workstation is described. In the following description, numerous specific details are set forth such as the network topology, in order to provide a thorough understanding of the present invention. It will be apparent, however, to one skilled in the art that the present invention may be practiced without such specific details. In other instances, specific implementation details such as the steps for installation 10 of any particular application software package have not been shown in detail in order not to unnecessarily obscure the present invention.

The currently preferred embodiment of the present invention is implemented for operation in networking environments utilizing the NetWare Network Operating System, available from the Novell Corporation of Provo, Utah. The 15 respective workstations coupled to the network of the currently preferred embodiment would be executing the MS/DOS and the Windows operating system environments, both available from Microsoft Corporation of Seattle, Washington. However, these implementations are not meant to be limiting as to the scope of the present invention. It would be apparent to one skilled in the art to practice the 20 present invention in environments utilizing different network control operating systems and with workstations executing under non MS/DOS or non Windows operating systems.

Further, the following description uses the term "workstation" with respect to any computer system that a user or LAN Administrator may be using. The term 25 "workstation" is not meant to indicate or denote any particular class of computer systems. Finally, the following description will make reference to certain data files

and structures, e.g. a CONFIG. SYS file, that are well known to those familiar with the MS/DOS Operating System. Thus, further description of such data files and structures is not deemed necessary.

*Overview of a Computer Systems in the Currently Preferred Embodiment*

- 5        A computer system embodying a workstation of the currently preferred embodiment is described with reference to Figure 1. A computer system 100 as may be utilized by the currently preferred embodiment generally comprises a bus structure or other communication means 101 for communicating information between the various components of the computer system, a processor means 102 coupled with said bus 101 for processing information, a random access memory (RAM) or other storage device 103 (commonly referred to as a main memory) coupled with said bus 101 for storing information and instructions for said processor 102, a read only memory (ROM) or other static storage device 104 coupled with said bus 101 for storing static information and instructions for said processor 102, a display monitor 105 coupled with said bus 101 for displaying textual, graphical and image data generated by the computer system, a data storage device 106, such as a magnetic disk and disk drive, coupled with said bus 101 for storing information and instructions, an alphanumeric input device 107 including alphanumeric and other keys coupled to said bus 101 for communicating information and command selections to said processor 102, a cursor control device 108, such as a mouse, track-ball, cursor control keys, etc., coupled to said bus 101 for communicating information and command selections to said processor 102 and for controlling cursor movement. Additionally, the system will typically include, one or more ports for receiving input signal data. Such ports are illustrated here as serial port 108 and parallel port 109.

The computer system 101 further includes a Local Area Network (LAN) adapter 111 for attaching to a LAN 112. The LAN Adapter 111 is coupled to CPU bus 101 and is used to transmit/receive information to/from the LAN 112.

5 It should further be noted that the processor 102 in the computer system would perform various of the processing functions, e.g. generation of the application installation package (LAN Administrator workstation), and actual installation of the application software (user workstation), which is described herein.

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#### *LAN Environment*

Figure 2 illustrates a local area networking environment of the currently preferred embodiment of the present invention. In the currently preferred embodiment, the LAN 205 is an Ethernet LAN. As mentioned above, the  
15 network control operating system is Novell NetWare. Referring back to Figure 2, a LAN Administrator workstation 201 is coupled to the LAN 205. A plurality of user workstations 202-204 are also coupled to the LAN 205. In operation, the LAN Administrator workstation 201 performs various functions in keeping the network and each of the individual user workstations operable. The present  
20 invention provides a means by which a LAN administrator can remotely schedule and cause the installation of application software on each of the user workstations 202-204. Without such a facility, the LAN administrator would have to physically install the application software on each of the user  
workstations 202-204. This is very inefficient since it may require "downtime" of  
25 the user workstation during work hours, thus causing a loss in productivity of the user. The alternative, having the application software installed during non-

work hours is also undesirable since it still requires the physical presence of the LAN administrator.

Further illustrated in Figure 2 is file server 206. In many LAN environments various server systems are provided which are shared resources for use and access by the users on the LAN. The file server 206 provides a shared disk storage resource for the LAN Administrator workstation 201 and the User workstations 202-204.

10 *Implementation Architecture of the Currently Preferred Embodiment*

In the currently preferred embodiment of the present invention, an installation package is generated at the LAN administrator's workstation that subsequently causes installation of the software on each of the target workstations. Each of the target workstation contains means for receiving the installation package and processing it so that the application software is installed. It should further be noted that the present invention assumes that the Operating System and Operating System levels and other systems files on the LAN administrator workstation and the various user workstations, are the same. If they were not the same, it is clear that the potential for error would be great.

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Figure 3 illustrates the architecture of the operating software residing on the LAN administrator workstation and the target user workstation in greater detail. Referring to Figure 3, a LAN administrator workstation 201 contains LAN administrators tools 301. The LAN administrators tools 310 include an installation scheduler 301a and installation package generator 301b. The installation scheduler 301a will allow the LAN administrator to schedule the automated installation of the new application software onto one or more user

workstations. It is important to note that the installation scheduler 301a allows the LAN administrator to perform the actual installation at a time when the LAN administrator may or may not be physically present. The installation package generator 301b is used to create the installation package by which the application software is installed. In the currently preferred embodiment, installation package 303 is stored on file server 206.

The target system i.e. the user workstations, contains a set of LAN client administration tools 302. The LAN client administration tools 302 on the target user workstation 202 include a termination and stay resident (TSR) program 302a which remains active in memory on the target workstation. The remote program resident on the LAN Administrator's workstation executes this TSR program and causes an installation program (here installation program 302b) to be invoked. TSR programs of this type are well known to those skilled in the art, so further description of the TSR program is not deemed necessary. The installation program 302b is also part of LAN client administration tools 302. The installation program 302b processes an installation package for installing the application software on the target system. The manner in which this is done will be described in greater detail below. Finally, a deinstallation program 302c is provided. The deinstallation program 302c will process a deinstallation package for removing applications from the target system.

### *Installation Package*

The installation package of the currently preferred embodiment of the present invention is generated in what is termed an IPACK format file. The IPACK format file defines various groups of commands which are used by the installation program residing on the user workstation to install the application

software. Further, the UPACK format file provides a series of commands for deinstallation of files on a computer system. The IPACK format file is described in greater detail in Appendix A.

5        In the currently preferred embodiment, the installation package includes the IPACK format file and the application software to be installed. This package is stored on a server system in a compressed format, and it will be later downloaded during the installation process. As is described in Appendix A, the IPACK format file will contain references to the actual physical location of the  
10      installation package in compressed format.

#### *Personality File*

A second file utilized in the present invention is the personality file. The personality file allows for custom installation of application software on a user  
15      workstation. For example, if the application is to be installed in a particular directory, it is specified through the personality file. A custom personality file resides on the user workstation. In operation, the installation program on the user workstation will search for a custom personality file. If no custom personality file is found, a default personality file will be utilized to perform the  
20      installation. The personality file format is described in greater detail in appendix B.

The incorporation of a personality file provides a great deal of flexibility for the installation of application software. A custom personality file would  
25      typically be created by the LAN Administrator according to the unique requirements of the user.

*Remote Installation of Application Software*

Remote installation of Application Software by the LAN Administrator is a two-step process; generation of an installation package and scheduling the installation at each of the desired user workstations. Figure 4 is a flowchart

- 5 which illustrates the steps performed by the LAN administrator workstation and the user workstations. In this description, the LAN administrator workstation will be referred to as the source workstation and the user workstations will be referred to as the target workstations. First, on the source workstation a pre-installation system snapshot is generated and saved, step 401. This pre-  
10 installation system snapshot will contain all the information that may be changed as a result of the installation of the application software, such as the complete disk directory structure contents, copies of various system and execution files(e.g. the CONFIG.SYS file and all \*.INI and \*.BAT files) and other operating system related information. Once the pre-installation system snapshot is stored  
15 the application software is installed, step 402. The installation of the application software is performed according to the instructions provided by the particular software application. In the DOS and WINDOWS environment of the currently preferred embodiment, the installation procedures for application software is not standardized. Thus, the present invention has been designed to be general  
20 enough to allow for various application installation scenarios. In any event, after the application software has been installed on the source workstation, a post installation system snapshot is generated, step 403. The post installation system snapshot contains the same information as the pre-installation system snapshot except that is taken after the application has been installed.

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An installation package is then generated by comparing the pre-installation system snapshot with the post installation snapshot, step 404. As

described above, the installation package will include the IPACK format file and the application software. The generation of the installation package is further illustrated in Figure 5. Figure 5 is a block diagram which illustrates the inputs and the resultant output for generating an installation package. The program

- 5 IPACKGEN 503 takes as inputs the pre-installation snapshot 501 and the post installation snapshot 502. As noted previously the pre-installation snapshot contains the state of the system prior to the installation of the application software. The post installation snapshot 502 contains the same information except that it is after the installation of the application software. IPACKGEN 503  
10 then compares the pre-installation snapshot 501 with the post installation snapshot 502 to determine their differences. When comparing the pre-installation snapshot with the post-installation snapshot, the respective disk directory structures, CONFIG.SYS, \*.INI, \*.BAT and other system related files are compared. The IPACK format file contains instructions to enable modification of  
15 the pre-installation snapshot so that it equals the post-installation files. The installation package 504 is then generated based on these differences (refer to Appendix A for the specific commands used and for various examples). In the currently preferred embodiment, the installation package is stored on a server system on the LAN.

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- Referring back to Figure 4, once the installation package is created the installation of the application software on each of the respective targets systems is scheduled, step 405. Such scheduling allows the LAN administrator to cause the installation of the application software at off hours, e.g. at night. It should be  
25 noted that in the currently preferred embodiment, the various steps performed by the LAN administrator are done via a dialog and windows type interface.

The LAN administrator would respond to prompts from the dialog that has been created for generating installation packages and the scheduling of installations.

- The mechanism for causing the transmission of the installation package to
- 5 a target user workstation utilizes the system clock as a trigger. Such a mechanism for triggering the transmission utilizing the system clock is a well known technique to those skilled in the art. Thus further description of such a technique is not deemed necessary.
- 10 Assuming that all installation are successful, the application software may optionally be deleted from the source system, step 406. This is provided for because most application software licenses are based on the number of workstations which may use the software. If the LAN administrator is not going to be using that particular application software they would not want to count
- 15 that copy of the application software on the LAN administrator systems towards the number being used.

- The operation of the target workstation is now described. Referring back to Figure 4, at a scheduled time, the remote program on the LAN Administrator's
- 20 workstation executes the TSR. At this point the install software will be invoked on the target workstation and will save the necessary files before the installation takes place, step 407. These files are saved so that in the event of an error, e.g. network failure during transmission of the application software, the application can be readily deinstalled. In any event, the installation software then looks to
- 25 see whether a custom personality file exists, step 408. If a custom personality file does not exist the application is installed based on the default personality file, step 409 otherwise, the application software is installed based on the custom

personality file, step 410. The operations occurring on the target side require no user interaction. The installation package contains the information needed to cause the application software to be installed.

5       The installation of the application software on the target workstation is further described with reference to Figure 6. Figure 6 is a block diagram which shows the installation of the application software on a target system. An installer (or installation program) 601 receives as input installation packet 602 and a personality file 603. Using these two files as input, an installed application 604 is  
10      created on the target system. This is accomplished by carrying out the installation commands set forth by the IPACK format file in accordance with parameters set out by the personality file. As noted previously, the installer 601 also saves the system and data files before the actual installation 605. As noted previously, the installer is initiated by a TSR program that is resident in the  
15      target system.

The installation program processes the IPACK format file and determines what files are needed and where they are placed. It then obtains these files from the compressed installation package on the server and places them in the appropriate directories. It also modifies system configuration files based on the directives provided in the IPACK format file. For example in the case of Windows applications, it creates a group (if necessary) and icons as dictated by the application software.  
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25      *Deinstallation of Application Software*

Mechanically, the deinstallation of application software is substantially similar to those for the installation of application software. Here, a UPACK

format file for the deinstallation of application software is generated. As a system snapshot has been created on each of the target workstations, prior to installation of the application software, this version of the various files are restored. A UPACK format file can be generally considered as the reverse of an

5 IPACK format file, where added files are deleted. The specific instructions in the UPACK format file are described in Appendix A.

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Thus, a method for installation of application software from a LAN

10 Administrator workstation on to a user workstation on a network is described.

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